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PATENT APPLICATION

ATTORNEY DOCKET NO. 200314885-1

IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Daniel R. Tretter et al.

Confirmation No.:

Application No.: 10/696,888

Examiner: Bernard Krasnic

Filing Date: October 30, 2003

Group Art Unit: 2621

Title: GENERATING AND DISPLAYING SPATIALLY OFFSET SUB-FRAMES ON DIFFERENT TYPES OF GRIDS

Mail Stop Appeal Brief-Patents
Commissioner For Patents
PO Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF

Transmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on June 1, 2007.

The fee for filing this Appeal Brief is (37 CFR 1.17(c)) $500.00.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

☐ (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d)) for the total number of months checked below:

☐ 1st Month $120	☐ 2nd Month $450	☐ 3rd Month $1020	☐ 4th Month $1590

☐ The extension fee has already been filed in this application.

☒ (b) Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

Please charge to Deposit Account 08-2025 the sum of $ 500. At any time during the pendency of this application, please charge any fees required or credit any over payment to Deposit Account 08-2025 pursuant to 37 CFR 1.25. Additionally please charge any fees to Deposit Account 08-2025 under 37 CFR 1.16 through 1.21 inclusive, and any other sections in Title 37 of the Code of Federal Regulations that may regulate fees.

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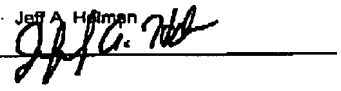
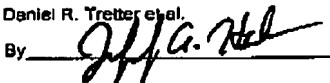
Signature: 

Respectfully submitted,
Daniel R. Tretter et al.
By 
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Rev 10/05a (ApiBrief)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Applicant:	Daniel R. Tretter et al.	Examiner: Bernard Krasnic
Serial No.:	10/696,888	Group Art Unit: 2621
Filed:	October 30, 2003	Docket No.: 200314885-1 / H304.125.101
Due Date:	**August 1, 2007**	
Title:	GENERATING AND DISPLAYING SPATIALLY OFFSET SUB-FRAMES ON DIFFERENT TYPES OF GRIDS	

APPEAL BRIEF UNDER 37 C.F.R. §41.37

Mail Stop Appeal Brief – Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir/Madam:

This Appeal Brief is submitted in support of the Notice of Appeal filed on June 1, 2007, appealing the final rejection of claims 1-42 of the above-identified application as set forth in the Final Office Action mailed April 5, 2007.

The U.S. Patent and Trademark Office is hereby authorized to charge Deposit Account No. 08-2025 in the amount of $500.00 for filing a Brief in Support of an Appeal (as set forth under 37 C.F.R. §41.20(b)(2)). At any time during the pendency of this application, please charge any required fees or credit any overpayment to Deposit Account No. 08-2025.

Appellant respectfully requests consideration and reversal of the Examiner's rejection of pending claims 1-42.

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Appeal Brief to the Board of Patent Appeals and Interferences
Applicant: Daniel R. Tretter et al.
Serial No.: 10/696,888
Filed: October 30, 2003
Docket No.: 200314885-1 / H304.125.101
Title: GENERATING AND DISPLAYING SPATIALLY OFFSET SUB-FRAMES ON DIFFERENT TYPES OF GRIDS

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REAL PARTY IN INTEREST

The real party in interest is Hewlett-Packard Development Company, LP having a principal place of business at 20555 S.H. 249 Houston, TX 77070, U.S.A. (hereinafter "HPDC"). HPDC is a Texas limited partnership and is a wholly-owned affiliate of Hewlett-Packard Company, a Delaware corporation, headquartered in Palo Alto, CA. The general or managing partner of HPDC is HPQ Holdings, LLC.

RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences known to Appellant that will have a bearing on the Board's decision in the present Appeal.

STATUS OF CLAIMS

Claims 1-42 are pending in the application, and are the subject of the present Appeal.

STATUS OF AMENDMENTS

No Amendments have been filed subsequent to the Final Office Action mailed April 5, 2007.

SUMMARY OF THE CLAIMED SUBJECT MATTER

Discussions relating to features of independent claims 1, 10, 19, 27, 31, and 37 can be found at least at the cited locations in the specification and drawings as below.

Claim 1 relates to a method of displaying an image with a display device (Fig. 1, 26). The method includes receiving image data (Fig. 1, 16) for the image on a first type of grid (Fig. 19A and 19B, 1362 or 1372). A first sub-frame and a second sub-frame (Fig. 1, 30) corresponding to the image data are generated. The first and the second sub-frames are each generated on a second type of grid (Fig. 19A and 19B, 1362 or 1372) that is different than the first type of grid. One of the first type of grid and the second type of grid is a non-rectangular grid (Fig. 19B, 1372). The method includes alternating between displaying the first sub-frame in a first position and displaying the second sub-frame in a second position spatially offset (Fig. 2C, 50 and 52) from the first position. (See, e.g., specification at page 6, line 3 to

page 13, line 24, and page 34, line 25, to page 37, line 19); Figures 1, 2C, 19A, and 19B; reference numbers 16, 26, 30, 50, 52, 1362, and 1372).

Claim 10 relates to a system (Fig. 1, 10) for displaying an image. The system includes a buffer (Fig. 1, 22) adapted to receive image data (Fig. 1, 16) for the image on a first type of grid (Fig. 19A and 19B, 1362 or 1372), and an image processing unit (Fig. 1, 24) configured to define first and second sub-frames (Fig. 1, 30) corresponding to the image data. The first and the second sub-frames are each defined on a second type of grid (Fig. 19A and 19B, 1362 or 1372) that is different than the first type of grid. One of the first type of grid and the second type of grid is a non-rectangular grid (Fig. 19B, 1372). The system includes a display device (Fig. 1, 26) adapted to alternately display the first sub-frame in a first position and the second sub-frame in a second position spatially offset (Fig. 2C, 50 and 52) from the first position. (See, e.g., specification at page 6, line 3 to page 13, line 24, and page 34, line 25, to page 37, line 19); Figures 1, 2C, 19A, and 19B; reference numbers 10, 16, 22, 24, 26, 30, 50, 52, 1362, and 1372).

Claim 19 relates to a system for generating low resolution sub-frames for display at spatially offset positions to generate the appearance of a high resolution image. The system includes **means for receiving** (Fig. 1, 34; specification at page 8, lines 11-14) a first high resolution image (Fig. 1, 28) on a first type of grid (Fig. 19A and 19B, 1362 or 1372), and **means for storing a relationship between low resolution sub-frame values and high resolution image values** (Fig. 1, 24; specification at page 13, lines 18-23). The relationship is based on minimization of an error metric between the high resolution image values and a simulated high resolution image (Fig. 11, 412, 512, 610, and 706) that is a function of the low resolution sub-frame values. The system includes **means for generating** (Fig. 1, 36; specification at page 8, lines 14-16) a first plurality of low resolution sub-frames (Fig. 1, 30) for display at spatially offset positions to generate the appearance of a high resolution image based on the first high resolution image and the stored relationship. Each of the low resolution sub-frames are generated on a second type of grid (Fig. 19A and 19B, 1362 or 1372). One of the first type of grid and the second type of grid is a non-rectangular grid (Fig. 19B, 1372). (See, e.g., specification at page 6, line 3 to page 13, line 24, and page 34, line

25, to page 37, line 19); Figures 1, 2C, 11, 19A, and 19B; reference numbers 24, 28, 30, 34, 36, 412, 512, 610, 706, 1362, and 1372).

Claim 27 relates to a computer-readable medium having computer-executable instructions for performing a method of generating low resolution sub-frames for display at spatially offset positions to generate the appearance of a high resolution image. The method includes receiving a first high resolution image (Fig. 1, 28) on a first type of grid (Fig. 19A and 19B, 1362 or 1372), and providing a relationship between sub-frame values and high resolution image values. The relationship is based on minimization of a difference between the high resolution image values and a simulated high resolution image (Fig. 11, 412, 512, 610, and 706) that is a function of the sub-frame values. The method includes generating a first plurality of low resolution sub-frames (Fig. 1, 30) for display at spatially offset positions (Fig. 2C, 50 and 52) to generate the appearance of a high resolution image based on the first high resolution image and the relationship between sub-frame values and high resolution image values. The first plurality of low resolution sub-frames is generated on a second type of grid (Fig. 19A and 19B, 1362 or 1372). One of the first type of grid and the second type of grid is a non-rectangular grid (Fig. 19B, 1372). (See, e.g., specification at page 6, line 3 to page 13, line 24, and page 34, line 25, to page 37, line 19); Figures 1, 2C, 11, 19A, and 19B; reference numbers 26, 28, 30, 50, 52, 412, 512, 610, 706, 1362, and 1372).

Claim 31 relates to a method of displaying an image with a display device (Fig. 1, 26). The method includes receiving image data (Fig. 1, 16) for the image on a first type of grid (Fig. 19A and 19B, 1362 or 1372), and generating a first frame (Fig. 1, 30) corresponding to the image data based on minimization of an error between the image data and a simulated image (Fig. 11, 412, 512, 610, and 706). The first frame is generated on a second type of grid (Fig. 19A and 19B, 1362 or 1372) that is different than the first type of grid. The method includes displaying the first frame on the second type of grid. One of the first type of grid and the second type of grid is a non-rectangular grid (Fig. 19B, 1372). (See, e.g., specification at page 6, line 3 to page 13, line 24, and page 34, line 25, to page 37, line 19); Figures 1, 11, 19A, and 19B; reference numbers 16, 26, 30, 412, 512, 610, 706, 1362, and 1372).

Claim 37 relates to a system (Fig. 1, 10) for displaying an image. The system includes a buffer (Fig. 1, 22) adapted to receive image data (Fig. 1, 16) for the image on a first type of grid (Fig. 19A and 19B, 1362 or 1372), and an image processing unit (Fig. 1, 24) configured to define a first frame (Fig. 1, 30) corresponding to the image data based on minimization of an error between the image data and a simulated image (Fig. 11, 412, 512, 610, and 706). The first frame is defined on a second type of grid (Fig. 19A and 19B, 1362 or 1372) that is different than the first type of grid. One of the first type of grid and the second type of grid is a non-rectangular grid (Fig. 19B, 1372). The system includes a display device (Fig. 1, 26) adapted to display the first frame on the second type of grid. (See, e.g., specification at page 6, line 3 to page 13, line 24, and page 34, line 25, to page 37, line 19); Figures 1, 11, 19A, and 19B; reference numbers 16, 22, 24, 26, 30, 412, 512, 610, 706, 1362, and 1372).

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

I. Claims 1-5 and 10-14 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Gibbon et al., U.S. Publication No. 2003/0020809 ("Gibbon") in view of Messing et al., U.S. Patent No. 6,466,618 ("Messing").

II. Claims 6-7, 15, 16, 19-24, 27-34, and 37-40 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing, and further in view of Park ("Super-Resolution Image Reconstruction: A Technical Overview"; IEEE Signal Processing Magazine; Vol. 2, pp. 21-36; May 2003).

III. Claims 8, 9, 17, 18, 25, 26, 35, 36, 41, and 42 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing and Park, and further in view of Nomura et al., U.S. Patent No. 6,990,249 ("Nomura") and Tanaka et al., Japan Patent No. 54136135 ("Tanaka").

ARGUMENT

I. Examiner Interview

Appellant thanks Examiners Bernard Krasnic and Jingge Wu for the courtesies extended to Appellant's representative, Jeff A. Holmen, during a telephonic interview conducted on May 30, 2007, during which the Examiner's interpretation and Applicant's understanding of Messing et al., U.S. Patent No. 6,466,618 ("Messing") as applied to claims 1 and 2 was discussed. No agreement was reached.

II. Applicable Law

The Examiner has the burden under 35 U.S.C. §103 to establish a *prima facie* case of obviousness. *In re Fine*, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). Three criteria must be satisfied to establish a *prima facie* case of obviousness. First, the Examiner must show that some objective teaching in the prior art or some knowledge generally available to one of ordinary skill in the art would teach, suggest, or motivate one to modify a reference or to combine the teachings of multiple references. *Id.* Second, the prior art can be modified or combined only so long as there is a reasonable expectation of success. *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Third, the prior art reference or combined prior art references must teach or suggest all of the claim limitations. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). These three criteria are also set forth in §706.02(j) of the M.P.E.P. In performing the obviousness inquiry under 35 U.S.C. §103, the Examiner must avoid hindsight. *In re Bond*, 910 F.2d 831, 834, 15 USPQ2d 1566, 1568 (Fed. Cir. 1990), *reh'g denied*, 1990 U.S. App. LEXIS 19971 (Fed. Cir. 1990).

III. Rejection of Claims 1-5 and 10-14 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing.

Claims 1-5 and 10-14 were rejected under 35 U.S.C. §103(a) as being unpatentable over Gibbon et al., U.S. Publication No. 2003/0020809 ("Gibbon") in view of Messing et al., U.S. Patent No. 6,466,618 ("Messing"). Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of claims 1-5 and 10-14.

A. Rejection of Claim 1 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing.

Independent claim 1 recites "receiving image data for the image on a first type of grid", "generating a first sub-frame and a second sub-frame corresponding to the image data, the first and the second sub-frames each generated on a second type of grid that is different than the first type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid", and "alternating between displaying the first sub-frame in a first position and displaying the second sub-frame in a second position spatially offset from the first position."

There is no teaching or suggestion in Gibbon regarding receiving image data for an image on a first type of grid, and generating sub-frames corresponding to the image data on a second type of grid that is different than the first type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid. Rather, Gibbon uses a rectangular grid for all images. (See, e.g., Gibbon at Figures 3-6 and corresponding description). The Examiner's argument that "low resolution or in other words smaller grid size is considered to be a different grid" (Final Office Action at para. no. 6, page 7) ignores the language used in claim 1. These claims do not simply recite "a different grid". Rather, they recite "a second type of grid that is different than the first type of grid". Gibbon uses the same type of grid for all images.

In the Response to Argument section of the Final Office Action, the Examiner stated the following:

> Applicant's arguments with respect to independent claims 1, 10, 19, 27, 31, and 37 have been considered but are moot in view of the new ground(s) of rejection. The Gibbon reference previously used to reject independent claims 1 and 10, and the Gibbon in view of Park references previously used to reject independent claims 19, 27, 31, and 37 require an additional reference Messing et al (US 6,466,618 B1, this reference was disclosed and used as part of the rejections in the Examiners original Non-Final Office Action) because the **applicant has included the further limitation "wherein one of the first type of grid and the second type of grid is a non-rectangular grid" to the independent claims 1 , 10, 19, 27, 31, and 37** (see Applicants Reply – page 4, lines 6-7 of claim 1, page 5, lines 6-7 of claim 10, etc.). **Obviously Gibbon and Park either alone or in combination do not teach this amended**

> **limitation to the independent claims**, therefore Messing in view of these references is used to refute the amended independent claims 1, 10, 19, 27, 31, and 37. (Final Office Action at para. no. 3, pages 2-3) (emphasis added).

As shown above, the Examiner has acknowledged that Gibbon does not teach or suggest "wherein one of the first type of grid and the second type of grid is a non-rectangular grid", as recited in claim 1. With respect to the Messing reference, the Examiner stated that "Messing discloses one of the first type of grid / rectangular grid and the second type of grid / irregular grid or quincunx grid or a diamond grid is a non-rectangular grid (see Fig. 6, the first type rectangular grid is on the high resolution image 72 and the second type diamond grid is on the low resolution image 78, col. 5, lines 1-3, col. 6, lines 8-34, col. 7, lines 49-50)." (Final Office Action at para. no. 6, page 8). Messing at col. 5, lines 1-3, which was cited by the Examiner, discloses "low resolution images where the plurality of color planes of each of the low resolution images are spatially arranged in at least a partially non-coincident manner." This disclosure regarding color planes of an image does not teach or suggest receiving image data for an image on a first type of grid, and generating sub-frames corresponding to the image data on a second type of grid that is different than the first type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid.

Messing at col. 6, lines 8-34, which was cited by the Examiner, discloses a technique for extracting color images from a low resolution CCD sensor. The technique includes sampling the green color field 78 on a quincunx grid. (Messing at col. 6, line 28). This disclosure regarding sampling a single color field on a quincunx grid does not teach or suggest receiving image data for an image on a first type of grid, and generating a first sub-frame and a second sub-frame corresponding to the image data on a second type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid.

The Examiner also cited Messing at col. 7, lines 49-50, which discusses the multi-frame resampler 150. The multi-frame resampler 150 resamples multiple low-resolution sampled frames 110 to generate a high resolution frame 154. (See, e.g., Messing at col. 6, lines 44-45, and col. 7, lines 32-34). This disclosure regarding resampling multiple low-resolution sampled frames to generate a high resolution frame does not teach or suggest

receiving image data for an image on a first type of grid, and generating a first sub-frame and a second sub-frame corresponding to the image data on a second type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid.

In view of the above, Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of independent claim 1, and the rejection of independent claim 1 under 35 U.S.C. §103(a) should be withdrawn.

B. Rejection of Claim 2 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing.

Dependent claim 2 recites "the method of claim 1, wherein the first type of grid is a rectangular grid and the second type of grid is a diamond grid." Since this claim further defines independent claim 1, the resulting claim recites receiving image data for the image on a rectangular grid, generating a first sub-frame and a second sub-frame corresponding to the image data on a diamond grid, and alternating between displaying the first sub-frame in a first position and displaying the second sub-frame in a second position spatially offset from the first position. As discussed above with respect to independent claim 1, Gibbon uses a rectangular grid for all images (See, e.g., Gibbon at Figures 3-6 and corresponding description). Gibbon does not teach or suggest receiving image data for an image on a rectangular grid, and generating a first sub-frame and a second sub-frame corresponding to the image data on a diamond grid. Gibbon also does not teach or suggest displaying such sub-frames (i.e., sub-frames on a diamond grid) in a spatially offset manner.

Messing also does not teach or suggest receiving image data for the image on a rectangular grid, and generating a first sub-frame and a second sub-frame corresponding to the image data on a diamond grid. With respect to the Messing reference, the Examiner stated that "Messing further discloses first type of grid is a rectangular grid (see Fig. 6, the image 72 is on a regular rectangular grid, col. 6, lines 8-34) and the second type of grid is a diamond grid (see Fig. 6, the image 78 is on a irregular grid or in other words on a quincunx or in other words on a diamond grid, col. 6, lines 8-34)." (Final Office Action at para. no. 6, pages 8-9). The Examiner stated above that "image 72 is on a regular rectangular grid". Element 72 of Messing is a color filter array (Messing at col. 6, line 16). The Examiner

stated above that "the image 78 is on a irregular grid". Element 78 of Messing is a green sub-lattice of the color filter array 72 (Messing at col. 6, lines 22-24). Messing at col. 6, lines 8-34, which was cited by the Examiner, discloses a technique for extracting color images from a low resolution CCD sensor. The technique includes sampling the green color field 78 on a quincunx grid. (Messing at col. 6, line 28). This disclosure regarding sampling a single color field on a quincunx grid does not teach or suggest receiving image data for an image on a rectangular grid, and generating a first sub-frame and a second sub-frame corresponding to the image data on a diamond grid. Each captured image in Messing will only include a single green color field (as opposed to the generation of first and second sub-frames).

In addition, there is no teaching or suggestion in Messing that the green color field itself is even a displayable image. Rather, Messing discloses that the red, green, and blue sub-sampled raw image data is transformed by a CCDDSP algorithm into a displayable color picture on an orthogonal grid (see, e.g., Messing at col. 5, line 57, to col. 6, line 3). Thus, like the Gibbon reference, Messing also does not teach or suggest displaying first and second sub-frames (generated on a diamond grid) in a spatially offset manner.

Since dependent claim 2 further limits patentably distinct claim 1, and is further distinguishable over the cited references, claim 2 is believed to be allowable over the cited references. Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of dependent claim 2, and the rejection of dependent claim 2 under 35 U.S.C. §103(a) should be withdrawn.

C. Rejection of Claim 3 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing.

Dependent claim 3 recites "the method of claim 2, wherein the image data includes rectangular-shaped pixels on the rectangular grid, and the first and the second sub-frames each include diamond-shaped pixels on the diamond grid." The Examiner has not cited any disclosure in Gibbon or Messing that teaches or suggests first and second sub-frames that include diamond-shaped pixels on a diamond grid. Since dependent claim 3 further limits patentably distinct claim 1, and is further distinguishable over the cited references, claim 3 is believed to be allowable over the cited references. Appellant respectfully submits that the

Examiner has not established a *prima facie* case of obviousness of dependent claim 3, and the rejection of dependent claim 3 under 35 U.S.C. §103(a) should be withdrawn.

D. Rejection of Claim 4 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing.

Dependent claim 4 recites "the method of claim 1, wherein the first type of grid is a diamond grid and the second type of grid is a rectangular grid." Since this claim further defines independent claim 1, the resulting claim recites receiving image data for the image on a diamond grid, and generating a first sub-frame and a second sub-frame corresponding to the image data on a rectangular grid. The Examiner has not cited any disclosure in Gibbon that teaches or suggests receiving image data for an image on a diamond grid, and generating first and second sub-frames corresponding to such image data (i.e., image data on a diamond grid) on a rectangular grid. The Examiner pointed to Figure 7 of Messing as allegedly teaching the limitations of dependent claim 4. (See, Final Office Action at para. no. 6, page 9). Figure 7 shows a green color field 78 on a quincunx grid being transformed by the CCDDSP algorithm 100 into a green color field 106 on a rectangular grid. (See, e.g., Messing at col. 6, lines 30-34). This disclosure regarding transforming a single color field on a quincunx grid into a rectangular grid does not teach or suggest receiving image data for an image on a diamond grid, and generating a first sub-frame and a second sub-frame corresponding to the image data on a rectangular grid. Each captured image in Messing will only include a single green color field (as opposed to the generation of first and second sub-frames).

Since dependent claim 4 further limits patentably distinct claim 1, and is further distinguishable over the cited references, claim 4 is believed to be allowable over the cited references. Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of dependent claim 4, and the rejection of dependent claim 4 under 35 U.S.C. §103(a) should be withdrawn.

E. Rejection of Claim 5 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing.

Dependent claim 5 recites "the method of claim 4, wherein the image data includes diamond-shaped pixels on the diamond grid, and the first and the second sub-frames each include rectangular-shaped pixels on the rectangular grid." The Examiner has not cited any disclosure in Gibbon or Messing that teaches or suggests image data with diamond-shaped pixels on a diamond grid, or generating first and second sub-frames corresponding to such image data (i.e., image data with diamond-shaped pixels on a diamond grid) with rectangular-shaped pixels on a rectangular grid. Since dependent claim 5 further limits patentably distinct claim 1, and is further distinguishable over the cited references, claim 5 is believed to be allowable over the cited references. Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of dependent claim 5, and the rejection of dependent claim 5 under 35 U.S.C. §103(a) should be withdrawn.

F. Rejection of Claim 10 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing.

Independent claim 10 recites "a buffer adapted to receive image data for the image on a first type of grid", "an image processing unit configured to define first and second sub-frames corresponding to the image data, the first and the second sub-frames each defined on a second type of grid that is different than the first type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid", and "a display device adapted to alternately display the first sub-frame in a first position and the second sub-frame in a second position spatially offset from the first position."

There is no teaching or suggestion in Gibbon regarding receiving image data for an image on a first type of grid, and defining sub-frames corresponding to the image data on a second type of grid that is different than the first type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid. Rather, Gibbon uses a rectangular grid for all images. (See, e.g., Gibbon at Figures 3-6 and corresponding description). The Examiner's argument that "low resolution or in other words smaller grid size is considered to be a different grid" (Final Office Action at para. no. 6, page 7) ignores the language used in claim 1. These claims do not simply recite "a different grid". Rather, they recite "a second

type of grid that is different than the first type of grid". Gibbon uses the same type of grid for all images.

In the Response to Argument section of the Final Office Action, the Examiner stated the following:

> Applicant's arguments with respect to independent claims 1, 10, 19, 27, 31, and 37 have been considered but are moot in view of the new ground(s) of rejection. The Gibbon reference previously used to reject independent claims 1 and 10, and the Gibbon in view of Park references previously used to reject independent claims 19, 27, 31, and 37 require an additional reference Messing et al (US 6,466,618 B1, this reference was disclosed and used as part of the rejections in the Examiners original Non-Final Office Action) because the **applicant has included the further limitation "wherein one of the first type of grid and the second type of grid is a non-rectangular grid" to the independent claims 1 , 10, 19, 27, 31, and 37** (see Applicants Reply – page 4, lines 6-7 of claim 1, page 5, lines 6-7 of claim 10, etc.). **Obviously Gibbon and Park either alone or in combination do not teach this amended limitation to the independent claims**, therefore Messing in view of these references is used to refute the amended independent claims 1, 10, 19, 27, 31, and 37. (Final Office Action at para. no. 3, pages 2-3) (emphasis added).

As shown above, the Examiner has acknowledged that Gibbon does not teach or suggest "wherein one of the first type of grid and the second type of grid is a non-rectangular grid", as recited in claim 10. With respect to the Messing reference, the Examiner stated that "Messing discloses one of the first type of grid / rectangular grid and the second type of grid / irregular grid or quincunx grid or a diamond grid is a non-rectangular grid (see Fig. 6, the first type rectangular grid is on the high resolution image 72 and the second type diamond grid is on the low resolution image 78, col. 5, lines 1-3, col. 6, lines 8-34, col. 7, lines 49-50)." (Final Office Action at para. no. 6, page 8). Messing at col. 5, lines 1-3, which was cited by the Examiner, discloses "low resolution images where the plurality of color planes of each of the low resolution images are spatially arranged in at least a partially non-coincident manner." This disclosure regarding color planes of an image does not teach or suggest receiving image data for an image on a first type of grid, and generating sub-frames corresponding to the image data on a second type of grid that is different than the first type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid.

Messing at col. 6, lines 8-34, which was cited by the Examiner, discloses a technique for extracting color images from a low resolution CCD sensor. The technique includes sampling the green color field 78 on a quincunx grid. (Messing at col. 6, line 28). This disclosure regarding sampling a single color field on a quincunx grid does not teach or suggest receiving image data for an image on a first type of grid, and generating a first sub-frame and a second sub-frame corresponding to the image data on a second type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid.

The Examiner also cited Messing at col. 7, lines 49-50, which discusses the multi-frame resampler 150. The multi-frame resampler 150 resamples multiple low-resolution sampled frames 110 to generate a high resolution frame 154. (See, e.g., Messing at col. 6, lines 44-45, and col. 7, lines 32-34). This disclosure regarding resampling multiple low-resolution sampled frames to generate a high resolution frame does not teach or suggest receiving image data for an image on a first type of grid, and generating a first sub-frame and a second sub-frame corresponding to the image data on a second type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid.

In view of the above, Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of independent claim 10, and the rejection of independent claim 10 under 35 U.S.C. §103(a) should be withdrawn.

G. Rejection of Claim 11 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing.

Dependent claim 11 recites "the system of claim 10, wherein the first type of grid is a rectangular grid and the second type of grid is a diamond grid." Since this claim further defines independent claim 10, the resulting claim recites receiving image data for the image on a rectangular grid, defining a first sub-frame and a second sub-frame corresponding to the image data on a diamond grid, and alternately displaying the first sub-frame in a first position and the second sub-frame in a second position spatially offset from the first position. As discussed above with respect to independent claim 10, Gibbon uses a rectangular grid for all images (See, e.g., Gibbon at Figures 3-6 and corresponding description). Gibbon does not teach or suggest receiving image data for an image on a rectangular grid, and defining a first

sub-frame and a second sub-frame corresponding to the image data on a diamond grid. Gibbon also does not teach or suggest displaying such sub-frames (i.e., sub-frames on a diamond grid) in a spatially offset manner.

Messing also does not teach or suggest receiving image data for the image on a rectangular grid, and defining a first sub-frame and a second sub-frame corresponding to the image data on a diamond grid. With respect to the Messing reference, the Examiner stated that "Messing further discloses first type of grid is a rectangular grid (see Fig. 6, the image 72 is on a regular rectangular grid, col. 6, lines 8-34) and the second type of grid is a diamond grid (see Fig. 6, the image 78 is on a irregular grid or in other words on a quincunx or in other words on a diamond grid, col. 6, lines 8-34)." (Final Office Action at para. no. 6, pages 8-9). The Examiner stated above that "image 72 is on a regular rectangular grid". Element 72 of Messing is a color filter array (Messing at col. 6, line 16). The Examiner stated above that "the image 78 is on a irregular grid". Element 78 of Messing is a green sub-lattice of the color filter array 72 (Messing at col. 6, lines 22-24). Messing at col. 6, lines 8-34, which was cited by the Examiner, discloses a technique for extracting color images from a low resolution CCD sensor. The technique includes sampling the green color field 78 on a quincunx grid. (Messing at col. 6, line 28). This disclosure regarding sampling a single color field on a quincunx grid does not teach or suggest receiving image data for an image on a rectangular grid, and defining a first sub-frame and a second sub-frame corresponding to the image data on a diamond grid. Each captured image in Messing will only include a single green color field (as opposed to the defining of first and second sub-frames).

In addition, there is no teaching or suggestion in Messing that the green color field itself is even a displayable image. Rather, Messing discloses that the red, green, and blue sub-sampled raw image data is transformed by a CCDDSP algorithm into a displayable color picture on an orthogonal grid (see, e.g., Messing at col. 5, line 57, to col. 6, line 3). Thus, like the Gibbon reference, Messing also does not teach or suggest displaying first and second sub-frames (generated on a diamond grid) in a spatially offset manner.

Since dependent claim 11 further limits patentably distinct claim 10, and is further distinguishable over the cited references, claim 11 is believed to be allowable over the cited references. Appellant respectfully submits that the Examiner has not established a *prima*

facie case of obviousness of dependent claim 11, and the rejection of dependent claim 11 under 35 U.S.C. §103(a) should be withdrawn.

H. Rejection of Claim 12 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing.

Dependent claim 12 recites "the system of claim 11, wherein the image data includes rectangular-shaped pixels on the rectangular grid, and the first and the second sub-frames each include diamond-shaped pixels on the diamond grid." The Examiner has not cited any disclosure in Gibbon or Messing that teaches or suggests first and second sub-frames that include diamond-shaped pixels on a diamond grid. Since dependent claim 12 further limits patentably distinct claim 10, and is further distinguishable over the cited references, claim 12 is believed to be allowable over the cited references. Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of dependent claim 12, and the rejection of dependent claim 12 under 35 U.S.C. §103(a) should be withdrawn.

I. Rejection of Claim 13 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing.

Dependent claim 13 recites "the system of claim 10, wherein the first type of grid is a diamond grid and the second type of grid is a rectangular grid." Since this claim further defines independent claim 10, the resulting claim recites receiving image data for the image on a diamond grid, and defining a first sub-frame and a second sub-frame corresponding to the image data on a rectangular grid. The Examiner has not cited any disclosure in Gibbon that teaches or suggests receiving image data for an image on a diamond grid, and defining first and second sub-frames corresponding to such image data (i.e., image data on a diamond grid) on a rectangular grid. The Examiner pointed to Figure 7 of Messing as allegedly teaching the limitations of dependent claim 13. (See, Final Office Action at para. no. 6, page 9). Figure 7 shows a green color field 78 on a quincunx grid being transformed by the CCDDSP algorithm 100 into a green color field 106 on a rectangular grid. (See, e.g., Messing at col. 6, lines 30-34). This disclosure regarding transforming a single color field on a quincunx grid into a rectangular grid does not teach or suggest receiving image data for an

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image on a diamond grid, and generating a first sub-frame and a second sub-frame corresponding to the image data on a rectangular grid. Each captured image in Messing will only include a single green color field (as opposed to the generation of first and second sub-frames).

Since dependent claim 13 further limits patentably distinct claim 10, and is further distinguishable over the cited references, claim 13 is believed to be allowable over the cited references. Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of dependent claim 13, and the rejection of dependent claim 13 under 35 U.S.C. §103(a) should be withdrawn.

J. Rejection of Claim 14 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing.

Dependent claim 14 recites "the system of claim 13, wherein the image data includes diamond-shaped pixels on the diamond grid, and the first and the second sub-frames each include rectangular-shaped pixels on the rectangular grid." The Examiner has not cited any disclosure in Gibbon or Messing that teaches or suggests image data with diamond-shaped pixels on a diamond grid, or generating first and second sub-frames corresponding to such image data (i.e., image data with diamond-shaped pixels on a diamond grid) with rectangular-shaped pixels on a rectangular grid. Since dependent claim 14 further limits patentably distinct claim 10, and is further distinguishable over the cited references, claim 14 is believed to be allowable over the cited references. Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of dependent claim 14, and the rejection of dependent claim 14 under 35 U.S.C. §103(a) should be withdrawn.

IV. Rejection of Claims 6, 7, 15, 16, 19-24, 27-34, and 37-40 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing, and further in view of Park.

Claims 6-7, 15, 16, 19-24, 27-34, and 37-40 were rejected under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing, and further in view of Park ("Super-Resolution Image Reconstruction: A Technical Overview"; IEEE Signal Processing

Magazine; Vol. 2, pp. 21-36; May 2003). Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of claims 6-7, 15, 16, 19-24, 27-34, and 37-40.

A. Rejection of Claims 6, 7, 15, and 16 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing, and further in view of Park.

Since dependent claims 6, 7, 15, and 16 further limit patentably distinct claim 1 or claim 10, and are further distinguishable over the cited references, claims 6, 7, 15, and 16 are believed to be allowable over the cited references. Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of dependent claims 6, 7, 15, and 16, and the rejection of dependent claims 6, 7, 15, and 16 under 35 U.S.C. §103(a) should be withdrawn.

B. Rejection of Claims 19 and 24 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing, and further in view of Park.

Independent claim 19 recites "means for receiving a first high resolution image on a first type of grid", and "means for generating a first plurality of low resolution sub-frames for display at spatially offset positions to generate the appearance of a high resolution image based on the first high resolution image and the stored relationship, each of the low resolution sub-frames generated on a second type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid." There is no teaching or suggestion in Gibbon regarding receiving a high resolution image on a first type of grid, and generating sub-frames on a second type of grid. Rather, Gibbon uses a rectangular grid for all images. (See, e.g., Gibbon at Figures 3-6 and corresponding description). The Examiner's argument that "low resolution or in other words smaller grid size is considered to be a different grid" (Final Office Action at para. no. 8, page 12) ignores the language used in claim 19. This claim does not simply recite "a different grid". Rather, it recites "a first type of grid" and "a second type of grid". Gibbon uses the same type of grid for all images.

In the Response to Argument section of the Final Office Action, the Examiner stated the following:

> Applicant's arguments with respect to independent claims 1, 10, 19, 27, 31, and 37 have been considered but are moot in view of the new ground(s) of rejection. The Gibbon reference previously used to reject independent claims 1 and 10, and the Gibbon in view of Park references previously used to reject independent claims 19, 27, 31, and 37 require an additional reference Messing et al (US 6,466,618 B1, this reference was disclosed and used as part of the rejections in the Examiners original Non-Final Office Action) because the **applicant has included the further limitation "wherein one of the first type of grid and the second type of grid is a non-rectangular grid" to the independent claims 1 , 10, 19, 27, 31, and 37** (see Applicants Reply – page 4, lines 6-7 of claim 1, page 5, lines 6-7 of claim 10, etc.). **Obviously Gibbon and Park either alone or in combination do not teach this amended limitation to the independent claims**, therefore Messing in view of these references is used to refute the amended independent claims 1, 10, 19, 27, 31, and 37. (Final Office Action at para. no. 3, pages 2-3) (emphasis added).

As shown above, the Examiner has acknowledged that Gibbon does not teach or suggest "wherein one of the first type of grid and the second type of grid is a non-rectangular grid", as recited in claim 19. With respect to the Messing reference, the Examiner stated that "Messing discloses one of the first type of grid / rectangular grid and the second type of grid / irregular grid or quincunx grid or a diamond grid is a non-rectangular grid (see Fig. 6, the first type rectangular grid is on the high resolution image 72 and the second type diamond grid is on the low resolution image 78, col. 5, lines 1-3, col. 6, lines 8-34, col. 7, lines 49-50)." (Final Office Action at para. no. 8, pages 12-13). Messing at col. 5, lines 1-3, which was cited by the Examiner, discloses "low resolution images where the plurality of color planes of each of the low resolution images are spatially arranged in at least a partially non-coincident manner." This disclosure regarding color planes of an image does not teach or suggest receiving a first high resolution image on a first type of grid, and generating a plurality of low resolution sub-frames for display at spatially offset positions to generate the appearance of a high resolution image based on the first high resolution image, each of the low resolution sub-frames generated on a second type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid. Messing at col. 6, lines 8-34, which was cited by the Examiner, discloses a technique for extracting color images from a

low resolution CCD sensor. The technique includes sampling the green color field 78 on a quincunx grid. (Messing at col. 6, line 28). This disclosure regarding sampling a single color field on a quincunx grid does not teach or suggest receiving a first high resolution image on a first type of grid, and generating a plurality of low resolution sub-frames for display at spatially offset positions to generate the appearance of a high resolution image based on the first high resolution image, each of the low resolution sub-frames generated on a second type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid.

The Examiner also cited Messing at col. 7, lines 49-50, which discusses the multi-frame resampler 150. The multi-frame resampler 150 resamples multiple low-resolution sampled frames 110 to generate a high resolution frame 154. (See, e.g., Messing at col. 6, lines 44-45, and col. 7, lines 32-34). This disclosure regarding resampling multiple low-resolution sampled frames to generate a high resolution frame does not teach or suggest receiving a first high resolution image on a first type of grid, and generating a plurality of low resolution sub-frames for display at spatially offset positions to generate the appearance of a high resolution image based on the first high resolution image, each of the low resolution sub-frames generated on a second type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid.

The Park publication also does not teach or suggest the above-quoted limitations of claim 19. In view of the above, Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of independent claim 19, and the rejection of independent claim 19 under 35 U.S.C. §103(a) should be withdrawn. Since dependent claim 24 further limits patentably distinct claim 19, and is further distinguishable over the cited references, claim 24 is believed to be allowable over the cited references. Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of dependent claim 24, and the rejection of dependent claim 24 under 35 U.S.C. §103(a) should be withdrawn.

C. Rejection of Claim 20 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing, and further in view of Park.

Dependent claim 20 recites "the system of claim 19, wherein the first type of grid is a rectangular grid and the second type of grid is a diamond grid." Since this claim further defines independent claim 19, the resulting claim recites receiving a first high resolution image on a rectangular grid, and generating a first plurality of low resolution sub-frames for display at spatially offset positions to generate the appearance of a high resolution image based on the first high resolution image, each of the low resolution sub-frames generated on a diamond grid. As discussed above with respect to independent claim 19, Gibbon uses a rectangular grid for all images (See, e.g., Gibbon at Figures 3-6 and corresponding description). Gibbon does not teach or suggest receiving a first high resolution image on a rectangular grid, and generating a first plurality of low resolution sub-frames for display at spatially offset positions to generate the appearance of a high resolution image based on the first high resolution image, each of the low resolution sub-frames generated on a diamond grid.

Messing also does not teach or suggest receiving a first high resolution image on a rectangular grid, and generating a first plurality of low resolution sub-frames for display at spatially offset positions to generate the appearance of a high resolution image based on the first high resolution image, each of the low resolution sub-frames generated on a diamond grid. With respect to the Messing reference, the Examiner stated that "Messing further discloses first type of grid is a rectangular grid (see Fig. 6, the image 72 is on a regular rectangular grid, col. 6, lines 8-34) and the second type of grid is a diamond grid (sec Fig. 6, the image 78 is on a irregular grid or in other words on a quincunx or in other words on a diamond grid, col. 6, lines 8-34)." (Final Office Action at para. no. 6, pages 8-9). The Examiner stated above that "image 72 is on a regular rectangular grid". Element 72 of Messing is a color filter array (Messing at col. 6, line 16). The Examiner stated above that "the image 78 is on a irregular grid". Element 78 of Messing is a green sub-lattice of the color filter array 72 (Messing at col. 6, lines 22-24). Messing at col. 6, lines 8-34, which was cited by the Examiner, discloses a technique for extracting color images from a low resolution CCD sensor. The technique includes sampling the green color field 78 on a quincunx grid. (Messing at col. 6, line 28). This disclosure regarding sampling a single color field on a quincunx grid does not teach or suggest generating a first plurality of low

resolution sub-frames based on the first high resolution image, each of the low resolution sub-frames generated on a diamond grid. Each captured image in Messing will only include a single green color field (as opposed to the generation of a plurality of low resolution sub-frames on a diamond grid).

In addition, there is no teaching or suggestion in Messing that the green color field itself is even a displayable image. Rather, Messing discloses that the red, green, and blue sub-sampled raw image data is transformed by a CCDDSP algorithm into a displayable color picture on an orthogonal grid (see, e.g., Messing at col. 5, line 57, to col. 6, line 3). Thus, like the Gibbon reference, Messing also does not teach or suggest generating a first plurality of low resolution sub-frames (on a diamond grid) for display at spatially offset positions to generate the appearance of a high resolution image based on the first high resolution image.

The Park publication also does not teach or suggest the above-quoted limitations of claim 20. Since dependent claim 20 further limits patentably distinct claim 19, and is further distinguishable over the cited references, claim 20 is believed to be allowable over the cited references. Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of dependent claim 20, and the rejection of dependent claim 20 under 35 U.S.C. §103(a) should be withdrawn.

D. Rejection of Claim 21 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing, and further in view of Park.

Dependent claim 21 recites "the system of claim 20, wherein the first high resolution image includes rectangular-shaped pixels on the rectangular grid, and the first plurality of low resolution sub-frames each include diamond-shaped pixels on the diamond grid." The Examiner has not cited any disclosure in Gibbon or Messing that teaches or suggests a plurality of low resolution sub-frames that include diamond-shaped pixels on a diamond grid. The Park publication also does not teach or suggest the above-quoted limitations of claim 21. Since dependent claim 21 further limits patentably distinct claim 19, and is further distinguishable over the cited references, claim 21 is believed to be allowable over the cited references. Appellant respectfully submits that the Examiner has not established a *prima*

facie case of obviousness of dependent claim 21, and the rejection of dependent claim 21 under 35 U.S.C. §103(a) should be withdrawn.

E. Rejection of Claim 22 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing, and further in view of Park.

Dependent claim 22 recites "the system of claim 19, wherein the first type of grid is a diamond grid and the second type of grid is a rectangular grid." Since this claim further defines independent claim 19, the resulting claim recites receiving a first high resolution image on a diamond grid, and generating a first plurality of low resolution sub-frames for display at spatially offset positions to generate the appearance of a high resolution image based on the first high resolution image, each of the low resolution sub-frames generated on a on a rectangular grid. The Examiner has not cited any disclosure in Gibbon that teaches or suggests receiving a first high resolution image on a diamond grid, and generating a plurality of low resolution sub-frames based on such a high resolution image (i.e., a high resolution image on a diamond grid) on a rectangular grid. The Examiner pointed to Figure 7 of Messing as allegedly teaching the similar limitations of dependent claim 13. (See, Final Office Action at para. no. 6, page 9). Figure 7 shows a green color field 78 on a quincunx grid being transformed by the CCDDSP algorithm 100 into a green color field 106 on a rectangular grid. (See, e.g., Messing at col. 6, lines 30-34). This disclosure regarding transforming a single color field on a quincunx grid into a rectangular grid does not teach or suggest receiving a high resolution image on a diamond grid, and generating a plurality of low resolution sub-frames on a rectangular grid based on the high resolution image. Each captured image in Messing will only include a single green color field (as opposed to the generation of a plurality of low resolution sub-frames).

The Park publication also does not teach or suggest the above-quoted limitations of claim 20. Since dependent claim 22 further limits patentably distinct claim 19, and is further distinguishable over the cited references, claim 22 is believed to be allowable over the cited references. Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of dependent claim 22, and the rejection of dependent claim 22 under 35 U.S.C. §103(a) should be withdrawn.

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F. Rejection of Claim 23 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing, and further in view of Park.

Dependent claim 23 recites "the system of claim 22, wherein the first high resolution image includes diamond-shaped pixels on the diamond grid, and the first plurality of low resolution sub-frames each include rectangular-shaped pixels on the rectangular grid." The Examiner has not cited any disclosure in Gibbon or Messing that teaches or suggests a high resolution image with diamond-shaped pixels on a diamond grid, or generating a plurality of low resolution sub-frames based on such a high resolution image (i.e., a high resolution image with diamond-shaped pixels on a diamond grid) with rectangular-shaped pixels on a rectangular grid. The Park publication also does not teach or suggest the above-quoted limitations of claim 23. Since dependent claim 23 further limits patentably distinct claim 19, and is further distinguishable over the cited references, claim 23 is believed to be allowable over the cited references. Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of dependent claim 23, and the rejection of dependent claim 23 under 35 U.S.C. §103(a) should be withdrawn.

G. Rejection of Claims 27 and 30 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing, and further in view of Park.

Independent claim 27 recites "receiving a first high resolution image on a first type of grid", and "generating a first plurality of low resolution sub-frames for display at spatially offset positions to generate the appearance of a high resolution image based on the first high resolution image and the relationship between sub-frame values and high resolution image values, the first plurality of low resolution sub-frames generated on a second type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid." There is no teaching or suggestion in Gibbon regarding receiving a high resolution image on a first type of grid, and generating sub-frames on a second type of grid. Rather, Gibbon uses a rectangular grid for all images. (See, e.g., Gibbon at Figures 3-6 and corresponding description). The Examiner's argument that "low resolution or in other words smaller grid

size is considered to be a different grid" (Final Office Action at para. no. 8, page 12) ignores the language used in claim 27. This claim does not simply recite "a different grid". Rather, it recites "a first type of grid" and "a second type of grid". Gibbon uses the same type of grid for all images.

In the Response to Argument section of the Final Office Action, the Examiner stated the following:

> Applicant's arguments with respect to independent claims 1, 10, 19, 27, 31, and 37 have been considered but are moot in view of the new ground(s) of rejection. The Gibbon reference previously used to reject independent claims 1 and 10, and the Gibbon in view of Park references previously used to reject independent claims 19, 27, 31, and 37 require an additional reference Messing et al (US 6,466,618 B1, this reference was disclosed and used as part of the rejections in the Examiners original Non-Final Office Action) because the **applicant has included the further limitation "wherein one of the first type of grid and the second type of grid is a non-rectangular grid" to the independent claims 1 , 10, 19, 27, 31, and 37** (see Applicants Reply – page 4, lines 6-7 of claim 1, page 5, lines 6-7 of claim 10, etc.). **Obviously Gibbon and Park either alone or in combination do not teach this amended limitation to the independent claims**, therefore Messing in view of these references is used to refute the amended independent claims 1, 10, 19, 27, 31, and 37. (Final Office Action at para. no. 3, pages 2-3) (emphasis added).

As shown above, the Examiner has acknowledged that Gibbon does not teach or suggest "wherein one of the first type of grid and the second type of grid is a non-rectangular grid", as recited in claim 27. With respect to the Messing reference, the Examiner stated that "Messing discloses one of the first type of grid / rectangular grid and the second type of grid / irregular grid or quincunx grid or a diamond grid is a non-rectangular grid (see Fig. 6, the first type rectangular grid is on the high resolution image 72 and the second type diamond grid is on the low resolution image 78, col. 5, lines 1-3, col. 6, lines 8-34, col. 7, lines 49-50)." (Final Office Action at para. no. 8, pages 12-13). Messing at col. 5, lines 1-3, which was cited by the Examiner, discloses "low resolution images where the plurality of color planes of each of the low resolution images are spatially arranged in at least a partially non-coincident manner." This disclosure regarding color planes of an image does not teach or suggest receiving a first high resolution image on a first type of grid, and generating a plurality of low resolution sub-frames for display at spatially offset positions to generate the

appearance of a high resolution image based on the first high resolution image, the plurality of low resolution sub-frames generated on a second type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid. Messing at col. 6, lines 8-34, which was cited by the Examiner, discloses a technique for extracting color images from a low resolution CCD sensor. The technique includes sampling the green color field 78 on a quincunx grid. (Messing at col. 6, line 28). This disclosure regarding sampling a single color field on a quincunx grid does not teach or suggest receiving a first high resolution image on a first type of grid, and generating a plurality of low resolution sub-frames for display at spatially offset positions to generate the appearance of a high resolution image based on the first high resolution image, the plurality of low resolution sub-frames generated on a second type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid.

The Examiner also cited Messing at col. 7, lines 49-50, which discusses the multi-frame resampler 150. The multi-frame resampler 150 resamples multiple low-resolution sampled frames 110 to generate a high resolution frame 154. (See, e.g., Messing at col. 6, lines 44-45, and col. 7, lines 32-34). This disclosure regarding resampling multiple low-resolution sampled frames to generate a high resolution frame does not teach or suggest receiving a first high resolution image on a first type of grid, and generating a plurality of low resolution sub-frames for display at spatially offset positions to generate the appearance of a high resolution image based on the first high resolution image, the plurality of low resolution sub-frames generated on a second type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid.

The Park publication also does not teach or suggest the above-quoted limitations of claim 27. In view of the above, Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of independent claim 27, and the rejection of independent claim 27 under 35 U.S.C. §103(a) should be withdrawn. Since dependent claim 30 further limits patentably distinct claim 27, and is further distinguishable over the cited references, claim 30 is believed to be allowable over the cited references. Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness

of dependent claim 30, and the rejection of dependent claim 30 under 35 U.S.C. §103(a) should be withdrawn.

H. Rejection of Claim 28 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing, and further in view of Park.

Dependent claim 28 recites "the computer-readable medium of claim 27, wherein the first type of grid is a rectangular grid and the second type of grid is a diamond grid." Since this claim further defines independent claim 27, the resulting claim recites receiving a first high resolution image on a rectangular grid, and generating a first plurality of low resolution sub-frames for display at spatially offset positions to generate the appearance of a high resolution image based on the first high resolution image, the first plurality of low resolution sub-frames generated on a diamond grid. As discussed above with respect to independent claim 27, Gibbon uses a rectangular grid for all images (See, e.g., Gibbon at Figures 3-6 and corresponding description). Gibbon does not teach or suggest receiving a first high resolution image on a rectangular grid, and generating a first plurality of low resolution sub-frames for display at spatially offset positions to generate the appearance of a high resolution image based on the first high resolution image, the plurality of low resolution sub-frames generated on a diamond grid.

Messing also does not teach or suggest receiving a first high resolution image on a rectangular grid, and generating a first plurality of low resolution sub-frames for display at spatially offset positions to generate the appearance of a high resolution image based on the first high resolution image, the plurality of low resolution sub-frames generated on a diamond grid. With respect to the Messing reference, the Examiner stated that "Messing further discloses first type of grid is a rectangular grid (see Fig. 6, the image 72 is on a regular rectangular grid, col. 6, lines 8-34) and the second type of grid is a diamond grid (see Fig. 6, the image 78 is on a irregular grid or in other words on a quincunx or in other words on a diamond grid, col. 6, lines 8-34)." (Final Office Action at para. no. 6, pages 8-9). The Examiner stated above that "image 72 is on a regular rectangular grid". Element 72 of Messing is a color filter array (Messing at col. 6, line 16). The Examiner stated above that "the image 78 is on a irregular grid". Element 78 of Messing is a green sub-lattice of the

color filter array 72 (Messing at col. 6, lines 22-24). Messing at col. 6, lines 8-34, which was cited by the Examiner, discloses a technique for extracting color images from a low resolution CCD sensor. The technique includes sampling the green color field 78 on a quincunx grid. (Messing at col. 6, line 28). This disclosure regarding sampling a single color field on a quincunx grid does not teach or suggest generating a first plurality of low resolution sub-frames based on the first high resolution image, the plurality of low resolution sub-frames generated on a diamond grid. Each captured image in Messing will only include a single green color field (as opposed to the generation of a plurality of low resolution sub-frames on a diamond grid).

In addition, there is no teaching or suggestion in Messing that the green color field itself is even a displayable image. Rather, Messing discloses that the red, green, and blue sub-sampled raw image data is transformed by a CCDDSP algorithm into a displayable color picture on an orthogonal grid (see, e.g., Messing at col. 5, line 57, to col. 6, line 3). Thus, like the Gibbon reference, Messing also does not teach or suggest generating a first plurality of low resolution sub-frames (on a diamond grid) for display at spatially offset positions to generate the appearance of a high resolution image based on the first high resolution image.

The Park publication also does not teach or suggest the above-quoted limitations of claim 28. Since dependent claim 28 further limits patentably distinct claim 27, and is further distinguishable over the cited references, claim 28 is believed to be allowable over the cited references. Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of dependent claim 28, and the rejection of dependent claim 28 under 35 U.S.C. §103(a) should be withdrawn.

I. Rejection of Claim 29 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing, and further in view of Park.

Dependent claim 29 recites "the computer-readable medium of claim 27, wherein the first type of grid is a diamond grid and the second type of grid is a rectangular grid." Since this claim further defines independent claim 27, the resulting claim recites receiving a first high resolution image on a diamond grid, and generating a first plurality of low resolution sub-frames for display at spatially offset positions to generate the appearance of a high

resolution image based on the first high resolution image, the plurality of low resolution sub-frames generated on a on a rectangular grid. The Examiner has not cited any disclosure in Gibbon that teaches or suggests receiving a first high resolution image on a diamond grid, and generating a plurality of low resolution sub-frames based on such a high resolution image (i.e., a high resolution image on a diamond grid) on a rectangular grid. The Examiner pointed to Figure 7 of Messing as allegedly teaching the similar limitations of dependent claim 13. (See, Final Office Action at para. no. 6, page 9). Figure 7 shows a green color field 78 on a quincunx grid being transformed by the CCDDSP algorithm 100 into a green color field 106 on a rectangular grid. (See, e.g., Messing at col. 6, lines 30-34). This disclosure regarding transforming a single color field on a quincunx grid into a rectangular grid does not teach or suggest receiving a high resolution image on a diamond grid, and generating a plurality of low resolution sub-frames on a rectangular grid based on the high resolution image. Each captured image in Messing will only include a single green color field (as opposed to the generation of a plurality of low resolution sub-frames).

The Park publication also does not teach or suggest the above-quoted limitations of claim 29. Since dependent claim 29 further limits patentably distinct claim 27, and is further distinguishable over the cited references, claim 29 is believed to be allowable over the cited references. Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of dependent claim 29, and the rejection of dependent claim 29 under 35 U.S.C. §103(a) should be withdrawn.

J. Rejection of Claims 31 and 34 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing, and further in view of Park.

Independent claim 31 recites "receiving image data for the image on a first type of grid", "generating a first frame corresponding to the image data based on minimization of an error between the image data and a simulated image, the first frame generated on a second type of grid that is different than the first type of grid", and "displaying the first frame on the second type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid." There is no teaching or suggestion in Gibbon regarding receiving image

data on a first type of grid, and generating a frame on a second type of grid that is different than the first type of grid. Rather, Gibbon uses a rectangular grid for all images. (See, e.g., Gibbon at Figures 3-6 and corresponding description). The Examiner's argument that "low resolution or in other words smaller grid size is considered to be a different grid" (Final Office Action at para. no. 6, page 7) ignores the language used in claim 31. This claim does not simply recite "a different grid". Rather, it recites "a second **type** of grid that is different than the first **type** of grid". Gibbon uses the same type of grid for all images.

In the Response to Argument section of the Final Office Action, the Examiner stated the following:

> Applicant's arguments with respect to independent claims 1, 10, 19, 27, 31, and 37 have been considered but are moot in view of the new ground(s) of rejection. The Gibbon reference previously used to reject independent claims 1 and 10, and the Gibbon in view of Park references previously used to reject independent claims 19, 27, 31, and 37 require an additional reference Messing et al (US 6,466,618 B1, this reference was disclosed and used as part of the rejections in the Examiners original Non-Final Office Action) because the **applicant has included the further limitation "wherein one of the first type of grid and the second type of grid is a non-rectangular grid" to the independent claims 1 , 10, 19, 27, 31, and 37** (see Applicants Reply – page 4, lines 6-7 of claim 1, page 5, lines 6-7 of claim 10, etc.). **Obviously Gibbon and Park either alone or in combination do not teach this amended limitation to the independent claims**, therefore Messing in view of these references is used to refute the amended independent claims 1, 10, 19, 27, 31, and 37. (Final Office Action at para. no. 3, pages 2-3) (emphasis added).

As shown above, the Examiner has acknowledged that Gibbon does not teach or suggest "wherein one of the first type of grid and the second type of grid is a non-rectangular grid", as recited in claim 31. With respect to the Messing reference, the Examiner stated that "Messing discloses one of the first type of grid / rectangular grid and the second type of grid / irregular grid or quincunx grid or a diamond grid is a non-rectangular grid (see Fig. 6, the first type rectangular grid is on the high resolution image 72 and the second type diamond grid is on the low resolution image 78, col. 5, lines 1-3, col. 6, lines 8-34, col. 7, lines 49-50)." (Final Office Action at para. no. 6, page 8). Messing at col. 5, lines 1-3, which was cited by the Examiner, discloses "low resolution images where the plurality of color planes of each of the low resolution images are spatially arranged in at least a partially non-coincident

manner." This disclosure regarding color planes of an image does not teach or suggest receiving image data for the image on a first type of grid, generating a first frame corresponding to the image data, the first frame generated on a second type of grid that is different than the first type of grid, and displaying the first frame on the second type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid.

Messing at col. 6, lines 8-34, which was cited by the Examiner, discloses a technique for extracting color images from a low resolution CCD sensor. The technique includes sampling the green color field 78 on a quincunx grid. (Messing at col. 6, line 28). This disclosure regarding sampling a single color field on a quincunx grid does not teach or suggest receiving image data for the image on a first type of grid, generating a first frame corresponding to the image data, the first frame generated on a second type of grid that is different than the first type of grid, and displaying the first frame on the second type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid.

The Examiner also cited Messing at col. 7, lines 49-50, which discusses the multi-frame resampler 150. The multi-frame resampler 150 resamples multiple low-resolution sampled frames 110 to generate a high resolution frame 154. (See, e.g., Messing at col. 6, lines 44-45, and col. 7, lines 32-34). This disclosure regarding resampling multiple low-resolution sampled frames to generate a high resolution frame does not teach or suggest receiving image data for the image on a first type of grid, generating a first frame corresponding to the image data, the first frame generated on a second type of grid that is different than the first type of grid, and displaying the first frame on the second type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid.

The Park publication also does not teach or suggest the above-quoted limitations of claim 31. In view of the above, Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of independent claim 31, and the rejection of independent claim 31 under 35 U.S.C. §103(a) should be withdrawn. Since dependent claim 34 further limits patentably distinct claim 31, and is further distinguishable over the cited references, claim 34 is believed to be allowable over the cited references. Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness

of dependent claim 34, and the rejection of dependent claim 34 under 35 U.S.C. §103(a) should be withdrawn.

K. Rejection of Claim 32 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing, and further in view of Park.

Dependent claim 32 recites "the method of claim 31, wherein the first type of grid is a rectangular grid and the second type of grid is a diamond grid." Since this claim further defines independent claim 31, the resulting claim recites receiving image data for the image on a rectangular grid, generating a first frame based on the image data on diamond grid, and displaying the first frame on a diamond grid. As discussed above with respect to independent claim 31, Gibbon uses a rectangular grid for all images (See, e.g., Gibbon at Figures 3-6 and corresponding description). Gibbon does not teach or suggest receiving image data for the image on a rectangular grid, generating a first frame based on the image data on diamond grid, and displaying the first frame on a diamond grid.

Messing also does not teach or suggest receiving image data for the image on a rectangular grid, generating a first frame based on the image data on diamond grid, and displaying the first frame on a diamond grid. With respect to the Messing reference, the Examiner stated that "Messing further discloses first type of grid is a rectangular grid (see Fig. 6, the image 72 is on a regular rectangular grid, col. 6, lines 8-34) and the second type of grid is a diamond grid (see Fig. 6, the image 78 is on a irregular grid or in other words on a quincunx or in other words on a diamond grid, col. 6, lines 8-34)." (Final Office Action at para. no. 6, pages 8-9). The Examiner stated above that "image 72 is on a regular rectangular grid". Element 72 of Messing is a color filter array (Messing at col. 6, line 16). The Examiner stated above that "the image 78 is on a irregular grid". Element 78 of Messing is a green sub-lattice of the color filter array 72 (Messing at col. 6, lines 22-24). Messing at col. 6, lines 8-34, which was cited by the Examiner, discloses a technique for extracting color images from a low resolution CCD sensor. The technique includes sampling the green color field 78 on a quincunx grid. (Messing at col. 6, line 28). This disclosure regarding sampling a single color field on a quincunx grid does not teach or suggest receiving image data for the image on a rectangular grid, generating a first frame based on the image data on diamond

grid, and displaying the first frame on a diamond grid. There is no teaching or suggestion in Messing that the green color field itself is even a displayable image. Rather, Messing discloses that the red, green, and blue sub-sampled raw image data is transformed by a CCDDSP algorithm into a displayable color picture on an orthogonal grid (see, e.g., Messing at col. 5, line 57, to col. 6, line 3).

The Park publication also does not teach or suggest the above-quoted limitations of claim 32. Since dependent claim 32 further limits patentably distinct claim 31, and is further distinguishable over the cited references, claim 32 is believed to be allowable over the cited references. Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of dependent claim 32, and the rejection of dependent claim 32 under 35 U.S.C. §103(a) should be withdrawn.

L. Rejection of Claim 33 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing, and further in view of Park.

Dependent claim 33 recites "the method of claim 32, wherein the image data includes rectangular-shaped pixels on the rectangular grid, and the first frame includes diamond-shaped pixels on the diamond grid." The Examiner has not cited any disclosure in Gibbon or Messing that teaches or suggests a displaying a frame that includes diamond-shaped pixels on a diamond grid. The Park publication also does not teach or suggest the above-quoted limitations of claim 33. Since dependent claim 33 further limits patentably distinct claim 31, and is further distinguishable over the cited references, claim 33 is believed to be allowable over the cited references. Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of dependent claim 33, and the rejection of dependent claim 33 under 35 U.S.C. §103(a) should be withdrawn.

M. Rejection of Claims 37 and 40 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing, and further in view of Park.

Independent claim 37 recites "receive image data for the image on a first type of grid", "define a first frame corresponding to the image data based on minimization of an error

between the image data and a simulated image, the first frame defined on a second type of grid that is different than the first type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid", and "display the first frame on the second type of grid." There is no teaching or suggestion in Gibbon regarding receiving image data on a first type of grid, and defining a frame on a second type of grid that is different than the first type of grid. Rather, Gibbon uses a rectangular grid for all images. (See, e.g., Gibbon at Figures 3-6 and corresponding description). The Examiner's argument that "low resolution or in other words smaller grid size is considered to be a different grid" (Final Office Action at para. no. 6, page 7) ignores the language used in claim 37. This claim does not simply recite "a different grid". Rather, it recites "a second type of grid that is different than the first type of grid". Gibbon uses the same type of grid for all images.

In the Response to Argument section of the Final Office Action, the Examiner stated the following:

> Applicant's arguments with respect to independent claims 1, 10, 19, 27, 31, and 37 have been considered but are moot in view of the new ground(s) of rejection. The Gibbon reference previously used to reject independent claims 1 and 10, and the Gibbon in view of Park references previously used to reject independent claims 19, 27, 31, and 37 require an additional reference Messing et al (US 6,466,618 B1, this reference was disclosed and used as part of the rejections in the Examiners original Non-Final Office Action) because the **applicant has included the further limitation "wherein one of the first type of grid and the second type of grid is a non-rectangular grid" to the independent claims 1 , 10, 19, 27, 31, and 37** (see Applicants Reply – page 4, lines 6-7 of claim 1, page 5, lines 6-7 of claim 10, etc.). **Obviously Gibbon and Park either alone or in combination do not teach this amended limitation to the independent claims**, therefore Messing in view of these references is used to refute the amended independent claims 1, 10, 19, 27, 31, and 37 (Final Office Action at para. no. 3, pages 2-3) (emphasis added).

As shown above, the Examiner has acknowledged that Gibbon does not teach or suggest "wherein one of the first type of grid and the second type of grid is a non-rectangular grid", as recited in claim 37. With respect to the Messing reference, the Examiner stated that "Messing discloses one of the first type of grid / rectangular grid and the second type of grid / irregular grid or quincunx grid or a diamond grid is a non-rectangular grid (see Fig. 6, the first type rectangular grid is on the high resolution image 72 and the second type diamond

grid is on the low resolution image 78, col. 5, lines 1-3, col. 6, lines 8-34, col. 7, lines 49-50)." (Final Office Action at para. no. 6, page 8). Messing at col. 5, lines 1-3, which was cited by the Examiner, discloses "low resolution images where the plurality of color planes of each of the low resolution images are spatially arranged in at least a partially non-coincident manner." This disclosure regarding color planes of an image does not teach or suggest receiving image data for the image on a first type of grid, defining a first frame corresponding to the image data, the first frame generated on a second type of grid that is different than the first type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid, and displaying the first frame on the second type of grid.

Messing at col. 6, lines 8-34, which was cited by the Examiner, discloses a technique for extracting color images from a low resolution CCD sensor. The technique includes sampling the green color field 78 on a quincunx grid. (Messing at col. 6, line 28). This disclosure regarding sampling a single color field on a quincunx grid does not teach or suggest receiving image data for the image on a first type of grid, defining a first frame corresponding to the image data, the first frame generated on a second type of grid that is different than the first type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid, and displaying the first frame on the second type of grid.

The Examiner also cited Messing at col. 7, lines 49-50, which discusses the multi-frame resampler 150. The multi-frame resampler 150 resamples multiple low-resolution sampled frames 110 to generate a high resolution frame 154. (See, e.g., Messing at col. 6, lines 44-45, and col. 7, lines 32-34). This disclosure regarding resampling multiple low-resolution sampled frames to generate a high resolution frame does not teach or suggest receiving image data for the image on a first type of grid, defining a first frame corresponding to the image data, the first frame generated on a second type of grid that is different than the first type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid, and displaying the first frame on the second type of grid.

The Park publication also does not teach or suggest the above-quoted limitations of claim 37. In view of the above, Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of independent claim 37, and the rejection of independent claim 37 under 35 U.S.C. §103(a) should be withdrawn. Since dependent claim

40 further limits patentably distinct claim 37, and is further distinguishable over the cited references, claim 40 is believed to be allowable over the cited references. Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of dependent claim 40, and the rejection of dependent claim 40 under 35 U.S.C. §103(a) should be withdrawn.

N. Rejection of Claim 38 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing, and further in view of Park.

Dependent claim 38 recites "the system of claim 37, wherein the first type of grid is a rectangular grid and the second type of grid is a diamond grid. Since this claim further defines independent claim 37, the resulting claim recites receiving image data for the image on a rectangular grid, defining a first frame based on the image data on diamond grid, and displaying the first frame on a diamond grid. As discussed above with respect to independent claim 37, Gibbon uses a rectangular grid for all images (See, e.g., Gibbon at Figures 3-6 and corresponding description). Gibbon does not teach or suggest receiving image data for the image on a rectangular grid, defining a first frame based on the image data on diamond grid, and displaying the first frame on a diamond grid.

Messing also does not teach or suggest receiving image data for the image on a rectangular grid, defining a first frame based on the image data on diamond grid, and displaying the first frame on a diamond grid. With respect to the Messing reference, the Examiner stated that "Messing further discloses first type of grid is a rectangular grid (see Fig. 6, the image 72 is on a regular rectangular grid, col. 6, lines 8-34) and the second type of grid is a diamond grid (see Fig. 6, the image 78 is on a irregular grid or in other words on a quincunx or in other words on a diamond grid, col. 6, lines 8-34)." (Final Office Action at para. no. 6, pages 8-9). The Examiner stated above that "image 72 is on a regular rectangular grid". Element 72 of Messing is a color filter array (Messing at col. 6, line 16). The Examiner stated above that "the image 78 is on a irregular grid". Element 78 of Messing is a green sub-lattice of the color filter array 72 (Messing at col. 6, lines 22-24). Messing at col. 6, lines 8-34, which was cited by the Examiner, discloses a technique for extracting color images from a low resolution CCD sensor. The technique includes sampling the green color

field 78 on a quincunx grid. (Messing at col. 6, line 28). This disclosure regarding sampling a single color field on a quincunx grid does not teach or suggest receiving image data for the image on a rectangular grid, defining a first frame based on the image data on diamond grid, and displaying the first frame on a diamond grid. There is no teaching or suggestion in Messing that the green color field itself is even a displayable image. Rather, Messing discloses that the red, green, and blue sub-sampled raw image data is transformed by a CCDDSP algorithm into a displayable color picture on an orthogonal grid (see, e.g., Messing at col. 5, line 57, to col. 6, line 3).

The Park publication also does not teach or suggest the above-quoted limitations of claim 38. Since dependent claim 38 further limits patentably distinct claim 37, and is further distinguishable over the cited references, claim 38 is believed to be allowable over the cited references. Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of dependent claim 38, and the rejection of dependent claim 38 under 35 U.S.C. §103(a) should be withdrawn.

O. Rejection of Claim 39 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing, and further in view of Park.

Dependent claim 39 recites "the system of claim 38, wherein the image data includes rectangular-shaped pixels on the rectangular grid, and the first frame includes diamond-shaped pixels on the diamond grid." The Examiner has not cited any disclosure in Gibbon or Messing that teaches or suggests a displaying a frame that includes diamond-shaped pixels on a diamond grid. The Park publication also does not teach or suggest the above-quoted limitations of claim 39. Since dependent claim 39 further limits patentably distinct claim 37, and is further distinguishable over the cited references, claim 39 is believed to be allowable over the cited references. Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of dependent claim 39, and the rejection of dependent claim 39 under 35 U.S.C. §103(a) should be withdrawn.

V. Rejection of Claims 8, 9, 17, 18, 25, 26, 35, 36, 41, and 42 under 35 U.S.C. §103(a) as being unpatentable over Gibbon in view of Messing, Park, Nomura, and Tanaka.

Since dependent claims 8, 9, 17, 18, 25, 26, 35, 36, 41, and 42 further limit patentably distinct claim 1, 10, 19, 31, or 37, and are further distinguishable over the cited references, claims 8, 9, 17, 18, 25, 26, 35, 36, 41, and 42 are believed to be allowable over the cited references. Appellant respectfully submits that the Examiner has not established a *prima facie* case of obviousness of dependent claims 8, 9, 17, 18, 25, 26, 35, 36, 41, and 42, and the rejection of dependent claims 8, 9, 17, 18, 25, 26, 35, 36, 41, and 42 under 35 U.S.C. §103(a) should be withdrawn.

CONCLUSION

For the above reasons, Appellants respectfully submit that the cited references neither anticipate nor render obvious claims of the pending Application. The pending claims distinguish over the cited references, and therefore, Appellants respectfully submit that the rejections must be withdrawn, and respectfully request the Examiner be reversed and claims 1-42 be allowed.

Any inquiry regarding this Response should be directed to either Jeff A. Holmen at Telephone No. (612) 573-0178, Facsimile No. (612) 573-2005 or Eileen Lehmann at Telephone No. (650) 857-7940, Facsimile No. (650) 852-6063. In addition, all correspondence should continue to be directed to the following address:

Appeal Brief to the Board of Patent Appeals and Interferences
Applicant: Daniel R. Tretter et al.
Serial No.: 10/696,888
Filed: October 30, 2003
Docket No.: 200314885-1 / H304.125.101
Title: GENERATING AND DISPLAYING SPATIALLY OFFSET SUB-FRAMES ON DIFFERENT TYPES OF GRIDS

IP Administration
Legal Department, M/S 35
HEWLETT-PACKARD COMPANY
P.O. Box 272400
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Respectfully submitted,

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CLAIMS APPENDIX

1. A method of displaying an image with a display device, the method comprising:

receiving image data for the image on a first type of grid;

generating a first sub-frame and a second sub-frame corresponding to the image data, the first and the second sub-frames each generated on a second type of grid that is different than the first type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid; and

alternating between displaying the first sub-frame in a first position and displaying the second sub-frame in a second position spatially offset from the first position.

2. The method of claim 1, wherein the first type of grid is a rectangular grid and the second type of grid is a diamond grid.

3. The method of claim 2, wherein the image data includes rectangular-shaped pixels on the rectangular grid, and the first and the second sub-frames each include diamond-shaped pixels on the diamond grid.

4. The method of claim 1, wherein the first type of grid is a diamond grid and the second type of grid is a rectangular grid.

5. The method of claim 4, wherein the image data includes diamond-shaped pixels on the diamond grid, and the first and the second sub-frames each include rectangular-shaped pixels on the rectangular grid.

6. The method of claim 1, wherein the first sub-frame and the second sub-frame are generated on the second type of grid based on minimization of an error between the image data and a simulated image.

7. The method of claim 6, wherein the simulated image is based on a convolution of the first and the second sub-frames with an interpolating filter.

8. The method of claim 7, wherein the interpolating filter includes five filter coefficients.

9. The method of claim 8, wherein the five filter coefficients include four coefficients each having a value of one-eighth and one coefficient having a value of one-half.

10. A system for displaying an image, the system comprising:

a buffer adapted to receive image data for the image on a first type of grid;

an image processing unit configured to define first and second sub-frames corresponding to the image data, the first and the second sub-frames each defined on a second type of grid that is different than the first type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid; and

a display device adapted to alternately display the first sub-frame in a first position and the second sub-frame in a second position spatially offset from the first position.

11. The system of claim 10, wherein the first type of grid is a rectangular grid and the second type of grid is a diamond grid.

12. The system of claim 11, wherein the image data includes rectangular-shaped pixels on the rectangular grid, and the first and the second sub-frames each include diamond-shaped pixels on the diamond grid.

13. The system of claim 10, wherein the first type of grid is a diamond grid and the second type of grid is a rectangular grid.

14. The system of claim 13, wherein the image data includes diamond-shaped pixels on the diamond grid, and the first and the second sub-frames each include rectangular-shaped pixels on the rectangular grid.

15. The system of claim 10, wherein the image processing unit is configured to define the first and the second sub-frames based on minimization of an error between the image data and a simulated image.

16. The system of claim 15, wherein the simulated image is based on a convolution of the first and the second sub-frames with an interpolating filter.

17. The system of claim 16, wherein the interpolating filter includes five filter coefficients.

18. The system of claim 17, wherein the five filter coefficients include four coefficients each having a value of one-eighth and one coefficient having a value of one-half.

19. A system for generating low resolution sub-frames for display at spatially offset positions to generate the appearance of a high resolution image, the system comprising:

means for receiving a first high resolution image on a first type of grid;

means for storing a relationship between low resolution sub-frame values and high resolution image values, the relationship based on minimization of an error metric between the high resolution image values and a simulated high resolution image that is a function of the low resolution sub-frame values; and

means for generating a first plurality of low resolution sub-frames for display at spatially offset positions to generate the appearance of a high resolution image based on the first high resolution image and the stored relationship, each of the low resolution sub-frames generated on a second type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid.

20. The system of claim 19, wherein the first type of grid is a rectangular grid and the second type of grid is a diamond grid.

21. The system of claim 20, wherein the first high resolution image includes rectangular-shaped pixels on the rectangular grid, and the first plurality of low resolution sub-frames each include diamond-shaped pixels on the diamond grid.

22. The system of claim 19, wherein the first type of grid is a diamond grid and the second type of grid is a rectangular grid.

23. The system of claim 22, wherein the first high resolution image includes diamond-shaped pixels on the diamond grid, and the first plurality of low resolution sub-frames each include rectangular-shaped pixels on the rectangular grid.

24. The system of claim 19, wherein the simulated high resolution image is based on a convolution of the first plurality of low resolution sub-frames with an interpolating filter.

25. The system of claim 24, wherein the interpolating filter includes five filter coefficients.

26. The system of claim 25, wherein the five filter coefficients include four coefficients each having a value of one-eighth and one coefficient having a value of one-half.

27. A computer-readable medium having computer-executable instructions for performing a method of generating low resolution sub-frames for display at spatially offset positions to generate the appearance of a high resolution image, comprising:

receiving a first high resolution image on a first type of grid;

providing a relationship between sub-frame values and high resolution image values, the relationship based on minimization of a difference between the high resolution image values and a simulated high resolution image that is a function of the sub-frame values; and

generating a first plurality of low resolution sub-frames for display at spatially offset positions to generate the appearance of a high resolution image based on the first high resolution image and the relationship between sub-frame values and

high resolution image values, the first plurality of low resolution sub-frames generated on a second type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid.

28. The computer-readable medium of claim 27, wherein the first type of grid is a rectangular grid and the second type of grid is a diamond grid.

29. The computer-readable medium of claim 27, wherein the first type of grid is a diamond grid and the second type of grid is a rectangular grid.

30. The computer-readable medium of claim 27, wherein the simulated high resolution image is based on a convolution of the first plurality of sub-frames with an interpolating filter.

31. A method of displaying an image with a display device, the method comprising:
receiving image data for the image on a first type of grid;
generating a first frame corresponding to the image data based on minimization of an error between the image data and a simulated image, the first frame generated on a second type of grid that is different than the first type of grid; and
displaying the first frame on the second type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid.

32. The method of claim 31, wherein the first type of grid is a rectangular grid and the second type of grid is a diamond grid.

33. The method of claim 32, wherein the image data includes rectangular-shaped pixels on the rectangular grid, and the first frame includes diamond-shaped pixels on the diamond grid.

34. The method of claim 31, wherein the simulated image is based on a convolution of the first frame with an interpolating filter.

35. The method of claim 34, wherein the interpolating filter includes five filter coefficients.

36. The method of claim 35, wherein the five filter coefficients include four coefficients each having a value of one-half and one coefficient having a value of one.

37. A system for displaying an image, the system comprising:

a buffer adapted to receive image data for the image on a first type of grid;

an image processing unit configured to define a first frame corresponding to the image data based on minimization of an error between the image data and a simulated image, the first frame defined on a second type of grid that is different than the first type of grid, wherein one of the first type of grid and the second type of grid is a non-rectangular grid; and

a display device adapted to display the first frame on the second type of grid.

38. The system of claim 37, wherein the first type of grid is a rectangular grid and the second type of grid is a diamond grid.

39. The system of claim 38, wherein the image data includes rectangular-shaped pixels on the rectangular grid, and the first frame includes diamond-shaped pixels on the diamond grid.

40. The system of claim 37, wherein the simulated image is based on a convolution of the first frame with an interpolating filter.

41. The system of claim 40, wherein the interpolating filter includes five filter coefficients.

42. The system of claim 41, wherein the five filter coefficients include four coefficients each having a value of one-half and one coefficient having a value of one.

EVIDENCE APPENDIX

All the evidence related to this Appeal is on the record and before the Board. Therefore, no additional evidence is identified in this Appendix.

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RELATED PROCEEDINGS APPENDIX

There are no additional related proceedings to be considered in this Appeal. Therefore, no such proceedings are identified in this Appendix.